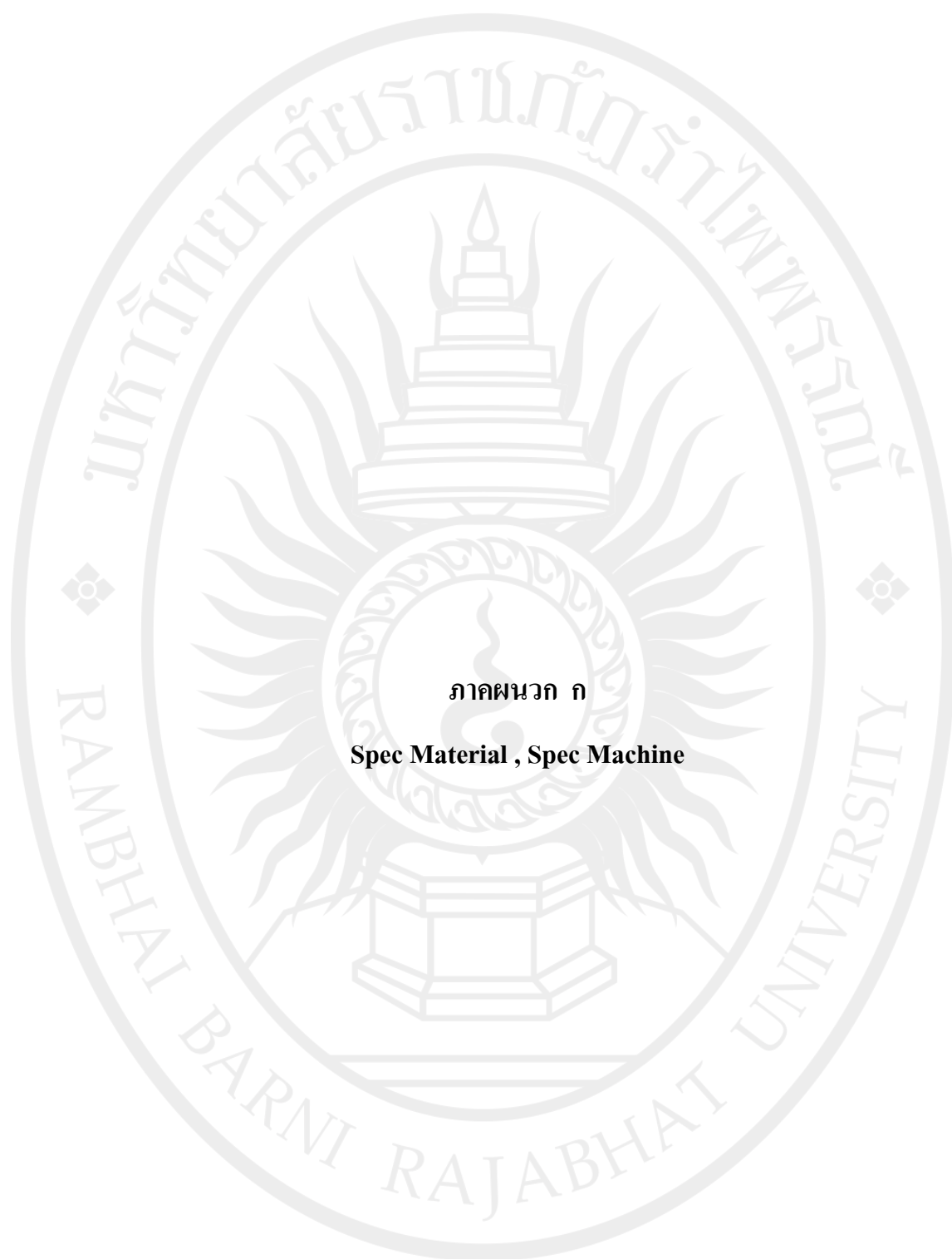




ลิขสิทธิ์ของมหาวิทยาลัยราชภัฏรำไพพรรณี



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**Spec Material , Spec Machine**

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**Spec Material**

Spec Material PP Hostacom HC ERC 342N

<b>Rheological properties</b>	<b>Value</b>	<b>Unit</b>	<b>Test Standard</b>
Melt flow index (MFI)	25	g/10 min	ISO 1133
MFI temperature	230	°c	ISO 1133
MFI load	2.16	kg	ISO 1133
<b>Mechanical properties</b>	<b>Value</b>	<b>Unit</b>	<b>Test Standard</b>
Yield stress	23	MPa	ISO 527-1/-2
Yield strain	5	%	ISO 527-1/-2
Flexural modulus (23°C)	1900	MPa	ISO 178
Izod Impact notched (23°C)	34	kJ/m <sup>2</sup>	ISO 180/1A
<b>Thermal properties</b>	<b>Value</b>	<b>Unit</b>	<b>Test Standard</b>
Temp. of deflection under load (0.45 MPa)	109	°C	ISO 1183
Other properties			
Density	1030	Kg/m <sup>3</sup>	ISO 1183
<b>Characteristics</b>			
<b>Processing</b>			
Injection Molding			
<b>Special Characteristics</b>			
High impact or impact modified			
<b>Applications</b>			
Automotive			
<b>Regional Availability</b>			
North America,Europe,Asia Pacific,South and Central America,Near East/Africa			

## Spec Machine TOSHIBA IS 850 GT

Main specifications						
Model			TOSHIBA IS 850 GT			
	Screw diameter		mm	105	105	120
	Theoretical injection capacity		cm <sup>3</sup>	4320	4320	5650
	Standard	Injection unit	—			
		Injection rate	cm <sup>3</sup> /s	840	840	1100
		Max. injection speed	mm/s			
		Max. injection pressure	MPa	1010	1010	1320
		Max. injection holding pressure	MPa			
	Clamping	Clamping force	kN	850		
		Clamping Stroke	mm	1750		
		Min. mold height	mm	500		
		Max. mold height	mm	1100		
		Tie bar clearance H X V	mm	1060x1060		
		Ejector force	kN	242		
		Ejector stroke	mm	200		
	Others	Machine dimension (L)	m	9		
		Machine dimensions (W X H)	m	2.8x2.3		



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ใบรับรองคุณสมบัติบัณฑิต

ลิขสิทธิ์ของมหาวิทยาลัยราชภัฏรำไพพรรณี



## ENGINEERING MATERIAL SPECIFICATION

### INTERIOR TRIM, ASSEMBLY PERFORMANCE SPECIFICATION

WSS-M15P4-E

#### 1. SCOPE

This specification defines the minimum durability and performance requirements of interior trim panels and moldings where various materials are combined to provide a trim assembly having decorative and/or functional features.

#### 2. APPLICATION

This specification was originally released for interior trim items such as door panel, center and overhead console, quarter panel, seat-back panel, A-, B-, C-, and D-pillar molding, hard instrument panels, all instrument panel components and garnish molding assemblies used in vehicles. All painted interior components shall meet requirements of WSS-M2P188-A1.

Testing must be conducted at each prototype and production build phase unless specified otherwise by Ford Engineering. See Table 1 for sample sizes.

Excluded from this specification are instrument panel pad and retainer, air bag covers, package trays, steering wheels, headlining and carpeting assemblies whose performance is specified separately.

This specification is based on virgin material only. The use of in-house regrind is not allowed unless approved by Materials Engineering. If approved, the part must then be validated during PV testing with the documented level of regrind noted on the part drawing.

#### 3. REQUIREMENTS

##### 3.0 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

Material suppliers and part producers must conform to the Company's Standard Requirements For Production Materials (WSS-M99P1111-A).

Note: Painted parts to be conditioned for 72 hours prior to test.

##### 3.4 APPEARANCE (FLTM BI 109-01)

The color, pattern, and finish shall match the approved Design Center master sample or shall be as specified on the engineering drawing.

Date	Action	Revisions
2005 07 14	Revised	Revised 2, 3.9.1, Table 1; Added 3.8.1.2, 3.9.2, 3.9.3 L. Soreide
2004 11 19	Revised	Entire spec revised L. Soreide/M. Masserant
1996 02 19	Activated	N. Komatsu, M. Masserant

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Page 1 of 11

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## ENGINEERING MATERIAL SPECIFICATION

WSS-M15P4-E

### 3.5 ENVIRONMENTAL TESTING

#### SAMPLE PREPARATION

All parts shall be fully trimmed including all components packaged in the environment (eg. speakers, hardware, wiring, etc.) and assembled onto actual or representative production support foundations that include not only all attaching points but also any boundary conditions that may restrict movement, unless otherwise specified by the affected Materials Engineering Activity. The retention methods, attachments and supporting garnish moldings (if any), shall be the same as proposed for production.

#### MEASUREMENT LOCATIONS

- Every twenty centimeters AND AT THE POINTS OF GREATEST MOVEMENT BETWEEN THE TWENTY CENTIMETER MARKS along the part's outside edges and internal openings.
- All "Interior Margin/Flushness Specification" locations for the specified carline as shown in the Body Engineering Office, Product Engineering General Specifications Manual unless otherwise specified by the affected Materials Engineering Activity.
- The "significant characteristics locations" specified on the engineering drawing.

#### MEASUREMENT TECHNIQUE

The movement at each measurement point shall be recorded in two directions: (1) in the x/y plane from the observers view, and (2) in the z-dimension direction into or out of the x/y plane from the observers view. The observer's view shall remain consistent always viewing from the front side of the part.

#### TEST PROCEDURE

Visually evaluate the part before, during, and after the test. Measure the part and record data at all specified locations at room temperature before and after cycling on the production support foundation or test fixture. Also, during para. 3.5.1 "Short Term Heat and Cold Cycle" testing, visually evaluate the part and measure any significant characteristic locations only, during the last half-hour of each cold and hot extreme temperature period.

Subject the number of assemblies specified to each of the cycles that follow in paragraphs 3.5.1, 3.5.2, and 3.5.3.

Automated programmable test cycles based on the listed test conditions may be accepted by prior agreement with the affected Materials Engineering Activity. Ramp speed 1 to 5 °C per minute. Record actual ramp speed on data sheet.

#### 3.5.1 Short Term Heat, Humidity and Cold Cycle

Test three previously unexposed assemblies:





## ENGINEERING MATERIAL SPECIFICATION

WSS-M15P4-E

3.5.1.1 Horizontal or vertical parts AT OR ABOVE THE BELT-LINE (e.g. sail; A-, B-, C-, and D-pillars; upper quarter panels; hard instrument panels and roof-rail moldings):

- . 5 h at -40 +/- 2 °C
- . 30 min at 23 +/- 2 °C and 50% R.H.
- . 5 h at 100 +/- 2 °C
- . 30 min at 23 +/- 2 °C and 50% R.H.
- . 2 h at 50 +/- 2 °C and 95 +/- 5% R.H.
- . 30 min at 23 +/- 2 °C and 50% R.H.
- . 5 h at -40 +/- 2 °C
- . 30 min at 23 +/- 2 °C and 50% R.H.
- . 5 h at 100 +/- 2 °C

3.5.1.2 Horizontal or vertical parts BELOW THE BELT-LINE (e.g., door panels, lower quarter trim panels, consoles and glove box doors and overhead consoles).

- . 5 h at -40 +/- 2 °C
- . 30 min at 23 +/- 2 °C and 50% R.H.
- . 5 h at 90 +/- 2 °C
- . 30 min at 23 +/- 2 °C and 50% R.H.
- . 2 h at 50 +/- 2 °C and 95 +/- 5% R.H.
- . 30 min at 23 +/- 2 °C and 50% R.H.
- . 5 h at -40 +/- 2 °C
- . 30 min at 23 +/- 2 °C and 50% R.H.
- . 5 h at 90 +/- 2 °C

3.5.1.3 Scuff plates, kick panels and other non-sun loaded floor level parts.

- . 5 h at -40 +/- 2 °C
- . 30 min at 23 +/- 2 °C and 50% R.H.
- . 5 h at 80 +/- 2 °C
- . 30 min at 23 +/- 2 °C and 50% R.H.
- . 2 h at 50 +/- 2 °C and 95 +/- 5% R.H.
- . 30 min at 23 +/- 2 °C and 50% R.H.
- . 5 h at -40 +/- 2 °C
- . 30 min at 23 +/- 2 °C and 50% R.H.
- . 5 h at 80 +/- 2 °C

3.5.2 Long Term Heat Exposure

Test one previously unexposed assembly as follows:

3.5.2.1 Horizontal or vertical parts AT OR ABOVE THE BELT-LINE (e.g. sail; A-, B-, C-, and D-pillars; upper quarter panels; hard instrument panels and roof-rail moldings):

- . 7 days at 100 +/- 2 °C





## ENGINEERING MATERIAL SPECIFICATION

WSS-M15P4-E

3.5.2.2 Horizontal or vertical parts BELOW THE BELT-LINE (e.g., door panels, lower quarter trim panels, consoles and glove box doors) and overhead consoles:

- . 7 days at 90 +/- 2 °C

3.5.2.3 Scuff plates, kick panels and other non-sun loaded floor level parts.

- . 7 days at 80 +/- 2 °C

3.5.3 Heat, Humidity, and Cold Cycle (Vehicle Test)

Test two previously unexposed assemblies:

- . 5 h at -40 +/- 2 °C
- . 30 min at 23 +/- 2 °C and 50% R.H.
- . 5 h at 90 +/- 2 °C
- . 30 min at 23 +/- 2 °C and 50% R.H.
- . 16 h at 50 +/- 2 °C and 95 +/- 5% R.H.
- . 30 min at 23 +/- 2 °C and 50% R.H.
- . 5 h at -40 +/- 2 °C
- . 30 min at 23 +/- 2 °C and 50% R.H.
- . 5 h at 90 +/- 2 °C

This test must be performed by Ford (or other Ford designated test lab) in a complete fully-trimmed body with surrounding parts (trim, hardware, insulators, wires, etc.) prior to final ISR approval unless otherwise specified by the affected Materials Engineering Activity.

3.5.4 Humidity Test (Fiberboard parts only)

Test five previously unexposed assemblies:

Thoroughly soak the top flange of the door or quarter panel by running at least 200 cc of water along the board adjacent to the weatherstrip region and allowing to soak in. Then place the complete assembly in vehicle position in an environmental chamber per the following cycle:

- . 16 h at 5 +/- 2 °C
- . 24 h at 38 °C and 95 +/- 5% R.H.

Then condition for:

- . 24 h at 23 +/- 2 °C and 50 +/- 5% R.H.



## ENGINEERING MATERIAL SPECIFICATION

WSS-M15P4-E

### Requirements:

The trimmed assemblies shall remain relatively unaffected by the exposure cycles during and after the tests as demonstrated:

- (1) Tactually/visually - no excessive tackiness, loss in surface-grain, or surface-color change (AATCC Procedure 1, Rating 4, min); no wrinkling, distortion, blistering, warping, delamination, blushing, hazing, milking, staining, waviness, or other objectionable visual appearance.
- (2) Functionally - no excessive expansion, shrinking, or warping that will interfere with normal functional operations.
- (3) Dimensionally - no movement exceeding 3.0 mm from the original installed position during or after the test; for the "significant characteristic locations", no movement exceeding 0.5 mm from the original installed position during or after the test.

Dimensional exceptions to these requirements may be allowed on the Engineering drawing.

### 3.6 INDENTATION AND RECOVERY (FLTM BO 111-02, Method "B") Not Applicable to Hard Plastics

All parts of the assembly shall return to their original contours within 5 minutes or within the time specified on the engineering drawing.

### 3.7 LOAD DEFLECTION (FLTM BO 113-03) Not Applicable to Hard Plastics

The test location, depth of deflection, and load value will appear on the engineering drawing when specified.

### 3.8 IMPACT RESISTANCE

#### 3.8.1 Rubber Ball 4.5 kg weight, 127 mm dia 60 +/- 5, Durometer "A", (ISO 686/ASTM D 2240)

The assembly shall show no evidence of cracking or breaking and shall fully recover from indentation in the time required for the assembly to return to 23 +/- 2 °C.

Test Method: Conduct this test with the trim assembly mounted on an actual or simulated production support foundation using the approved retention methods.

Drop the rubber ball from the height specified below at the impact locations indicated on the Engineering Drawing.

#### Drop Height

· Scuff Plates and Load Floor	610 mm
· Below belt line	460 mm
· Above belt line	305 mm

Exception to the above requirements shall be specified on the Engineering Drawing.



## ENGINEERING MATERIAL SPECIFICATION

WSS-M15P4-E

3.8.1.1 Room Temperature Impact  
(23 +/- 2 °C)

3.8.1.2 Cold Impact – for Land Rover, Jaguar and Ford of Europe Only  
(-30 +/- 2 °C)

Expose the mounted assembly for 24 h at 80 °C +/- 2 °C and then for 5 h at -30 +/- 2 °C. Drop the rubber ball while the part is in the cold box or within 10 seconds of its removal from the cold box.

3.8.2 Steel Ball for Speaker Grilles  
525 +/- 5 g, 50 +/- 2 mm diameter,  
440-C Stainless Steel Grade: 100,  
Hardness Rockwell C 57 to 61. Steel Ball

Drop Height

- Below armrest on door trim

406 mm\*

- Beltline on door trim, quarter trim, liftgate  
hard instrument panel and package tray

254 mm\*

\*Changes in the above drop height must be mutually agreed upon with the Design and Release Engineer and the applicable Materials Engineering Department.

3.8.2.1 Room Temperature Impact  
(23 +/- 2 °C)

### 3.9 COLOR AND APPEARANCE PROPERTIES

3.9.1 Resistance to Fade  
((SAE J1885), ISO 105 A-02/AATCC Evaluation Procedure 1)

Sample shall be tested as part of a production assembly composite.

	In Vehicle Sunlight Exposure Level	Test Exposure	AATCC Rating After Exposure, min
-	Low exposure: lower trim panels below armrest level	112.8 kJ/m <sup>2</sup>	Rating 4
-	Moderate exposure: upper trim panels and armrest	225.6 kJ/m <sup>2</sup>	Rating 4
-	High exposure: trim panel rollover, pillars, and garnish moldings	488.8 kJ/m <sup>2</sup>	Rating 3



## ENGINEERING MATERIAL SPECIFICATION

WSS-M15P4-E

Or for North American Programs only

(SAE J1885 modified (FLTM BO 116-01) ISO 105 A-02/AATCC Evaluation Procedure 1)

	In Vehicle Sunlight Exposure Level	Test Exposure	AATCC Rating After Exposure, min
-	Low exposure: lower trim panels below armrest level	225.6 kJ/m <sup>2</sup>	Rating 4
-	Moderate exposure: upper trim panels and armrest	601.6 kJ/m <sup>2</sup>	Rating 4
-	High exposure: trim panel rollover, pillars, and garnish moldings	1052.8 kJ/m <sup>2</sup>	Rating 4
-	Severe exposure: IP top and defroster grille	3609.6 kJ/m <sup>2</sup>	Rating 4
The materials shall be rejected if adhesive staining or other non-uniform staining results from material incompatibility.			
3.9.2	Coating Adhesion - For top coated or painted parts only see WSS-M2P188-A1 (FLTM BI 106-01, Method B)		Grade 0
3.9.3	Resistance to Cleaning Agents - For top coated or painted parts only see WSS-M2P188-A1 (FLTM BN 107-01, 10 cycles, max discoloration AATCC Evaluation Procedure 2)		Rating 4
Test Procedure: Evaluate topcoated or painted parts only. Saturate white cotton cloth with the cleaners listed.			
Cleaners:			
1) Window cleaner with ammonia			
2) All Purpose Cleaner ZC-11-A/B/C*			
3) Isopropyl Alcohol/Water 50% v/v (5 cycles, Rating 3)			
*or Ford Motor Company recommended equivalent			
3.9.4	Resistance to Crocking, min (FLTM BN 107-01, AATCC Evaluation Procedure 2)		
Dry and Wet		Rating 4	
3.9.5	Stain Resistance to Identification Markings (FLTM BO 112-06) Required of soft trim.		
No evidence of staining on the cover material surface.			



## ENGINEERING MATERIAL SPECIFICATION

WSS-M15P4-E

- 3.9.6 Resistance to Migration Staining (FLTM BN 103-01, AATCC Evaluation Procedure 2) Required of soft trim Rating 4

After test, the specimens and the accessory test materials must not show any surface deterioration, change in color tone (hue), or any other defects and they must be equal to or better than the sample originally approved by Materials Engineering.

### 3.10 ADHESION AND BONDING PROPERTIES

- 3.10.1 Dielectric Bond Strength, minimum average (FLTM BN 113-01 except age per para 3.5.1 and 3.5.2)

Original	5.0 N
Aged	75% of original

The above method is to be employed only for dielectric bonded materials.

All bond lines 25 mm wide or less and 25 mm x 200 mm cut specimens from samples with wider bonded areas must meet the above minimum requirements unless otherwise specified by the affected Materials Engineering Activity.

Specially bonded sections (such as corrugated designs, etc., as well as extra wide bonded areas exhibiting low prorated bond strength values) may be accepted provided they have been approved by the appropriate Materials Engineering Activity, and the Trim and Seating Engineering Activity.

- 3.10.2 Bonded Strength, minimum average (FLTM BN 151-05, except age per para 3.5.1 and 3.5.2)

Original	12 N*
Aged	75% of original result, no visual change in appearance

\*Cohesive failure below 12 N requires Materials Engineering approval.

The above method is to be employed for all adhesive or heat bonded materials, use 3.10.1 for evaluating dielectric bonds.

All bond lines 25 mm wide or less and 25 mm x 200 mm cut specimens from samples with wider bonded areas must meet the above minimum requirements unless otherwise specified by the affected Materials Engineering Activity.

Specially bonded sections (such as corrugated designs, etc., as well as extra wide bonded areas exhibiting low prorated bond strength values) may be accepted provided they have been approved by the appropriate Materials Engineering Activity, and the Trim and Seating Engineering Activity.





## ENGINEERING MATERIAL SPECIFICATION

WSS-M15P4-E

## 3.10.3 Bonded Buttons, Emblems, Etc., min

Tensile 205 kPa  
(FLTM BN 121-01)

Peel 1.1 N/mm width  
(FLTM BN 151-05)

Buttons shall conform to the tensile requirement; linear bonded emblems shall conform to the peel requirement.

## 3.10.4 Serviceability (Fasteners, Retainers, Etc.), min (FLTM BN 121-01)

Tensile:

Normal 200 N\*

At 45° angle 200 N\*

\*The fastener must release from support foundation before the trim assembly is damaged.

## 3.11 CLEANABILITY

3.11.1 Soiling and Cleanability  
(FLTM BN 112-06; ISO 105-A02/  
AATCC Evaluation Procedure 1)

Cleanability Rating 3

3.11.2 Soiling and Cleanability of Vinyl and Leather  
(FLTM BN 112-01) All Interior Trim

Soiling, max 15% loss in reflectance  
Cleanability, max 5% loss in reflectance

Cleanability Method: Rub back and forth ten times on the soiled specimen with a soft nonabrasive sponge that has been immersed in a mild soap solution (e.g. dishwashing soap solution); then re-measure and recalculate the loss in reflectance.

3.12 RESISTANCE TO SNAGGING  
(non-woven carpets only)  
(SAE J1530-A, H-18 wheels 500 g load)

50 cycles

No evidence of fiber pullout.



## ENGINEERING MATERIAL SPECIFICATION

WSS-M15P4-E

**3.13 TESTS FOR MOLD IN COLOR PLASTICS**

Samples to be take from flat areas of part. When flat areas at the part do not exist surrogate plaques with identical grain and processing conditions may be used.

- 3.13.1 Scratch Resistance (unpainted polyolefin parts and those in high touch zones) (FLTM BN 108-13, visual evaluation, 1 mm scratch balls, 2 N force) Rating 1

No whitening. Change in gloss is acceptable.

Instrumental measurement required in case of dispute as follows:

(FLTM BN 108-13, instrumental evaluation, 1 mm scratch balls, 3 N force)

Percentage of marking, max 30% scratch level unless otherwise specified

- 3.13.2 Resistance to Abrasion, Taber (unpainted plastic) (SAE J948, 500 g load, CS-10 wheels, 250 cycles)

No excess whitening or excessive wear.

**3.14 FOGGING**

(SAE J1756, 3 h at 100 °C heating, 21 °C cooling plate, post test conditioning 1 h and 16 h)

Fog Number, min 70

Formation of clear film, droplets or crystals is cause for rejection.

- 3.15 ODOR, max (FLTM BO 131-01)

Rating 2

North American Only: SAE J1351

Rating 2

- 3.16 FLAMMABILITY (ISO 3795/SAE J369)

Burn Rate, max 100 mm/minute





## ENGINEERING MATERIAL SPECIFICATION

WSS-M15P4-E

## MINIMUM SAMPLE REQUIREMENTS

Table 1

For paragraphs:	3 parts, use darker colors	1 part, use dark color	6 parts, any color	6 parts or 3 left/3 right, any color	6 parts of each color	3 parts each color	1 part each color
3.5.1 - Short Term Heat, Humidity and Cold Cycle	X						
3.5.2 - Long Term Heat Exposure		X					
3.5.3 - Heat, Humidity, and Cold Cycle	X						
3.5.4 - Humidity Test (Fiberboard)			X				
3.6 - Indentation and Recovery				X			
3.7 - Load Deflection				X			
3.8 - Impact Resistance (Room Temperature and Cold Impact) (if applicable)					X		
3.9.1 - Resistance to Fade						X	
3.9.2 - Coating Adhesion				X			
3.9.3 - Resistance to Cleaning Agents						X	
3.9.4 - Resistance to Crocking						X	
3.9.5 - Strain Resistance to Identification Markings						X	
3.9.6 - Resistance to Migration Staining						X	
3.10.1 - Dielectric Bond Strength			X				
3.10.2 - Bonded Strength			X				
3.10.3 - Bonded Buttons, Emblems, Etc.			X				
3.10.4 - Serviceability (Fasteners, Retainers, Etc.)				X			
3.11.1 - Soiling and Cleanability						X	
3.11.2 - Soiling and Cleanability of Vinyl and Leather						X	
3.12 - Resistance to Snagging						X	
3.13.1 - Scratch Resistance						X	
3.13.2 - Resistance to Abrasion						X	
3.14 - Fogging							X
3.15 - Odor							X
3.16 - Flammability*							

\*Test each color; the number of samples dependent on burn rate.

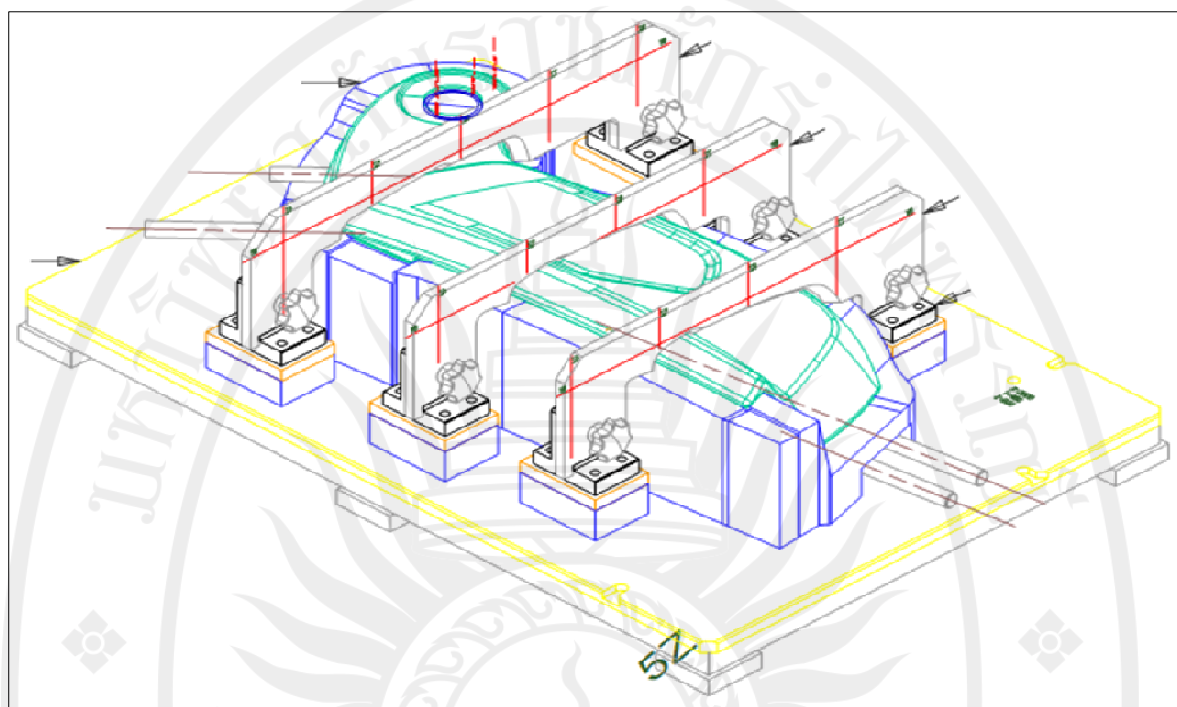


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INSPECTION REPORT

ลิขสิทธิ์ของมหาวิทยาลัยราชภัฏรำไพพรรณี

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ลิขสิทธิ์ของมหาวิทยาลัยราชภัฏรำไพพรรณี